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24 August 1979

East Europe Report

SCIENTIFIC AFFAIRS

No. 639



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EAST EUROPE REPORT
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INFORMATION ON MAGION SATELLITE UPDATED

Prague LETECTVI A KOSMONAUTIKA in Czech No 6, 1979 pp 227-228

[Article by Eng Jaroslav Vojta: "Magion 1978-99C"]

[Text] The launch of the Interkosmos 18 geophysical satellite was part of a worldwide scientific program for investigation of the magnetosphere (IMS). This satellite's experiments, aimed at exploring the connection between the earth's magnetosphere and ionosphere, include the study of the temporal and spatial structure of low-frequency electromagnetic fields in the ionosphere and magnetosphere by simultaneous measurement of several selected parameters at two points in space, i.e. by two satellites moving in the same orbit at some distance from each other. This is accomplished by means of a subsatellite, a small satellite called the MAGION (MAGnetosphere-IONosphere), which was developed and produced in Czechoslovakia and whose equipment complements that of the Interkosmos 18 mother satellite.

After separation of the subsatellite, the relative velocity of the two bodies is such that over the course of 14 days concurrent measurements can be taken at distances ranging from 1 to 100 km, thus accomplishing the major part of the scientific experiment. The MAGION satellite must also operate independently in orbit after conclusion of this phase of the experiment.

Design

The satellite is prismatic in shape with external dimensions of 300 x 300 x 150 mm; several antennas protrude from it. The frame of the satellite consists of two solid plates (top and bottom) connected by a central thermostat tube and four outer chambers for the electronic circuit boards. Two chemical batteries and two preamplifiers are located in the spaces between these chambers. To the top is attached a support for an antenna to receive the magnetic components of the VLF signals; a strip antenna of a transmitter in the 400 MHz band protrudes at an angle from the support. The strip antennas of two receivers for instructions and a transmitter in the 136 MHz band are fastened to the bottom surface; the longest antenna receives the electrical components of VLF signals and is fastened directly to the preamplifier boards.

On the sides of the satellite are 8 solar panels, with 4 more attached to the top and bottom. An adapter ring for mechanical attachment of the subsatellite to the separating mechanism in the mother satellite is attached to the middle of the bottom surface.

Power System

The primary source of electrical energy is the solar panels, which charge a chemical battery consisting of 8 nickel-cadmium cells. Since the satellite is not oriented toward the sun, only part of the surface of the solar panels is illuminated. Their average output during illumination by the sun is 2.7 W. The working chemical battery is charged by 14 solar panels, while 2 panels maintain a reserve battery at full charge. The capacity of each battery is 4 ampere-hours. The satellite's energy consumption when flying over the ground-based control station depends on the mode in which it is operating and varies from 3 to 10 W. In the remainder of its orbit, the satellite operates in an economy mode, consuming 1 W. This makes it possible to use the full operating condition of 10 W each time (4-5 times a day) the satellite passes through the zone of radio contact with the control station and the European receiving stations. If the voltage in the working chemical battery falls below a minimum value equal to 10 percent of battery capacity, the operating mode of the satellite automatically switches to consumption of 1 W. If the main battery fails, the power system automatically switches over to the reserve battery.

Heat Regulation System

The heat regulation system is passive. In order to achieve the desired temperature conditions, the absorptive and radiative properties of the materials on the surface of the satellite are used. Since most of the surface of the satellite (about 66 percent) is covered by the solar panels, which lower the average temperature inside the satellite to negative values, the rest of the satellite is covered with a microscopic layer of gold, which has turned out to be the most suitable material for increasing the temperature. In order to avoid temperature gradients between the illuminated and dark sides of the satellite, the frame is made of aluminum alloy and the thermal conductivity is improved at critical points by heat bridges. These measures allow maintenance of an average temperature between +10 and +30° C within the satellite, with a variation not exceeding ±3° C in the course of an orbit (alternation of sunlight and shadow).

Stabilization

In order to assure optimal conditions for operation of the scientific apparatus, the satellite is stabilized along the lines of force of the earth's magnetic field. The stabilization system includes four permanent bar magnets (total moment 6 A-m²) located on two opposite walls of the satellite in the space which houses the chemical batteries. Oscillations of the satellite relative to the magnetic force lines are damped by a loop made of a suitable

magnetic alloy. If the axis of the satellite deviates from the magnetic lines of force, hysteresis losses are induced by remagnetization of the loop material, damping the oscillation of the satellite.

The satellite is stabilized in a position in which the axis of the antenna for reception of the magnetic component of the VLF signals is perpendicular to the lines of force of the earth's magnetic field.

Communication and Telemetry System

This system receives commands and transmits scientific data and data on the operation of the various onboard systems. The satellite has two independent receivers, using a common decoder, for reception of commands. Each receiver has its own antenna. The command link operates in the VHF band at a frequency of 149.32 MHz.

The telemetry system has a transmitter operating on a frequency of 137.15 MHz (VHF range) with an output of 0.15 W, and a transmitter operating at a frequency of 400.57 MHz (UHF range) with an output averaging 1.5 W. Both transmitters are connected to quarter-wave strip antennas. The metal frame of the satellite to which the antenna of the 400 MHz transmitter is attached is inclined toward the surface of the northern hemisphere when passing above it by means of the magnetic stabilization system. This improves the radiation pattern of this antenna in the direction of the ground-based receiving stations. The UHF transmitter makes possible transmission of scientific data in two wide-band (80 Hz and 16 kHz) channels simultaneously with transmission of information on 4 subcarrier frequencies in accordance with IRIG standards. The VHF transmitter transmits information on operation of the satellite systems on two subcarrier frequencies.

The satellite telemetry system is equipped with a digital memory with a capacity of $1,024$ 8-bit bytes. This is used to record or sample 32 selected parameters at 94-minute intervals. The telemetry system and scientific apparatus can be put into full operation by a command from the control center or by program. After 16 minutes, the full operating regime is automatically terminated and only the most necessary systems remain in operation.

Two independent principles are employed to determine the satellite orbital elements. The first entails measurement of changes in a received frequency as a result of Doppler shift. To increase measurement accuracy, during the operating cycle excitation of the main oscillator of the UHF transmitter may be begun. The other method uses measurements of the distance between the satellite and a ground station made by a radio range finder.

Scientific Equipment

The main scientific apparatus of the satellite is the equipment for reception of natural VLF phenomena in the 80 Hz and 60 kHz bands. It consists of two receivers for the electrical and magnetic components. The electrical receiver

is equipped with a rod antenna 2 meters long and the magnetic component receiver with a ferrite antenna. The receiver includes a compressed amplifier which gives a 60 dB output for a 6 dB input, which is suitable for telemetric transmission. The output power can be increased further by a command to alter the transmission conditions. A spectrum analyzer can also be connected on command to the preamplifier for the magnetic or electric component. The analyzer operates in real time and has 16 channels logarithmically distributed over the VLF range received.

In addition the satellite has apparatus for measuring the electric field in the frequency range from 0.01 to 80 Hz. This uses a VLF antenna and preamplifier; the output from the apparatus is transmitted on a subcarrier frequency.

The measurements made by VLF receiver are supplemented by a unit for measuring the resonance properties of the plasma surrounding the satellite. This uses one of the command link antennas to excite the plasma. The amplitude and frequency of the exciting signal, in a frequency range up to 8 kHz, are controlled from the ground control station.

The satellite also carries equipment for recording the flux of charged particles: electrons with energies above 30 keV. The sensors for this equipment are four Geiger-Muller counters. The counters have an angle of vision of 30° and measure along the perpendicular to the earth's magnetic field.

Course of the Flight

The subsatellite was placed in a circular orbit together with the Interkosmos 18 satellite, which was launched from the USSR on 24 October 1978 (orbital parameters: $h_p=406$ km, $h_A=764$ km, $i=82.97$, $P=96.40$ min). During the first three days after the launch, the mother satellite was stabilized relative to the earth and to the velocity vector and all the support systems tested. In subsequent days, the individual parts of the scientific apparatus were turned on and tested one after another, and ground stations in the USSR, Bulgaria, East Germany and Czechoslovakia received the first scientific data. Immediately after testing of all instruments on the mother satellite was concluded and the first results evaluated, it was possible to proceed with separation of the subsatellite. This was done on the 314th orbit of the mother satellite on 14 November 1978 at 17.45 hours Universal Time, while it was flying from the equator towards central Europe, by a command from the ground station. The spring-loaded separating mechanism, located on the bottom of the Interkosmos 18 satellite, imparted a velocity of 0.424 m/sec to the subsatellite; the MAGION moved down and ahead at an angle of 60° relative to the mother satellite. After the 20 seconds required for the subsatellite to attain a sufficient distance from the mother satellite, time relays went into operation, giving the command to extend the strip antennas. At this moment the ground control station and the observatory of the Institute of Geophysics, Czechoslovak Academy of Sciences, in Pansky Ves, began to receive signals from the telemetry transmitter.

The orbit of the MAGION satellite averaged about 410 meters higher than that of Interkosmos 18, and accordingly the orbital period of the subsatellite was 0.5 seconds longer. The MAGION satellite began to fall behind the mother satellite. A day after the separation, the distance between the two objects was about 60 km, and it increased linearly in subsequent days.

During the first day of independent flight, the MAGION satellite stabilized its longitudinal axis in the direction of the lines of force of the earth's magnetic field with an accuracy better than $\pm 5^\circ$ in middle latitudes. The satellite revolves slightly around the axis of stabilization, performing one revolution every 3 minutes. As a result of this rotation, the entire surface of the satellite is evenly illuminated by the sun, thus creating the conditions for maintenance of the required temperature throughout the satellite. The temperature within the satellite stabilized at an average of $+50^\circ \text{C}$ on the first day after separation.

Operation of the Satellite

The satellite is controlled from a ground station located at the observatory of the Institute of Geophysics, Czechoslovak Academy of Sciences. Satellite operation proceeds according to a predetermined outline plan which is updated daily by teletype link with the coordinating center in Moscow.

When the satellite passes through the zone of radio contact with the control station, certain operating conditions are initiated. At the same time, telemetry information from the satellite is received and recorded. The input media are magnetic tape and recordings. The telemetry information is regularly received by stations in the USSR (Moscow, Apatity)

The MAGION Geophysical Satellite (1978-99C)--Working Designation "Block S"

Dimensions: Prism, 300 x 300 x 150 mm; total height with antenna mount 300 mm.

Weight: 15 kg total.

Missions: Monitoring the temporal and spatial structure of VLF fields in coordination with the Interkosmos 18 satellite.

Satellite operation: Institute of Geophysics, CSAV.

Launch: 24 October 1978 (with mother satellite); separation 14 November 1978 at 17.45 hours UT.

Orbit: Geocentric.

Perigee: 404 km.

Apogee: 762 km).

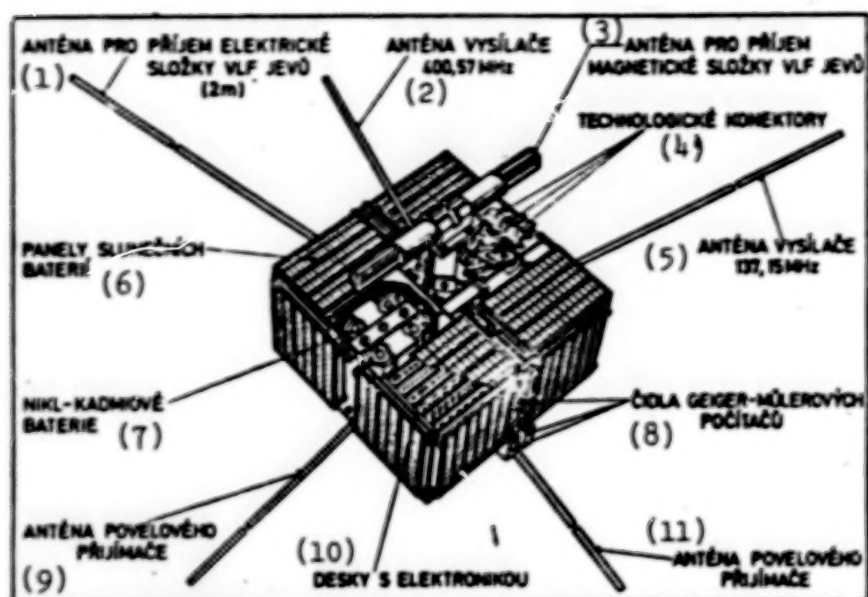
Inclination: 92.05° .

Orbital period: 96.36 minutes.

Stabilization: Magnetic, one axis.

Planned lifetime: 6 months.

Main suppliers: Institute of Geophysics, CSAV (scientific apparatus, part of support apparatus); Tesla-VUST (frame, part of support apparatus); IZMIRAN SSSR [Institute of the Ionosphere, Terrestrial Magnetism and Radio Wave Propagation, USSR Academy of Sciences] (solar panels).



Key:

- | | |
|--|----------------------------------|
| 1. Antenna for reception of electric component of VLF phenomena (2m) | 6. Solar panels |
| 2. Transmitting antenna (400.57 MHz) | 7. Nickel-cadmium battery |
| 3. Antenna for reception of magnetic component of VLF phenomena | 8. Geiger-Muller counter sensors |
| 4. Equipment connectors | 9. Antenna of command receiver |
| 5. Transmitting antenna (137.15 MHz) | 10. Electrical circuit boards |
| | 11. Antenna of command receiver |

9427

CSO: 2400

FLUID MECHANICS

UDC 621.223.001.5/.6

DESIGN OF AN OPTIMUM FLAT CASCADE FOR USE IN KAPLAN WATER TURBINES

Prague STROJIRENSTVI in Czech Vol 28 No 10, Oct 78 pp 619-622

CITAVY, J., State Research Institute for Machinery Design, Bechovice

[Abstract] The author refers to his thesis published in 1965, in which he studied flat compressor cascades with optimum distributions of velocities on the turbine blade profiles. He now shows that these principles can be applied to hydrodynamic designs of Kaplan turbines. The design of optimum flat cascades is based on the theory of boundary layers and of potential flows. Using the velocity distribution on the low pressure side of the blade we can determine the geometrical characteristics of the cascade by calculations on a digital computer. In these calculations a zero thickness of the blade is assumed. A series of calculations was performed and the results were used to develop a graph suitable for finding optimum parameters for a turbine for various operating conditions. The results can be used for blades with finite thicknesses. Figures 3; table 1; references 8 (Czech).

CSO: 1861

HOLOGRAPHIC RECORDINGS UNDER NON-IDEAL CONDITIONS

Prague JEMNA MECHANIKA A OPTIKA in Czech Vol 23 No 10, Oct 78 pp 271-274

KUTIK, MILAN, Tesla Research Institute for Vacuum Technology, Prague

[Abstract] The solidity of a holographic system is most important in preparation of holographic recordings. Therefore special tables are designed for such recordings; these tables are isolated from external vibrations and shocks. As the size of the lasers can be large, the tables which support them must also be large. The He-Ne laser developed by the Institute for Instrumentation Technology at Brno has an output of 70 mW and equals the performance of the best lasers made in other countries. This laser can be used for holography of large objects. In "non-ideal" conditions the laser may be placed elsewhere than on the holographic table; in some instances the table may not be used at all. The solidity of a holographic system may be observed by studying the interference field by a microscope. The author describes an experiment which he conducted to provide a holographic recording of a large object which was located at a substantial distance from the instrument. It is stated that a holographic experiment can be realized anywhere where stands for the optical elements can be located. Figures 9; references 12: 4 Czech, 2 Russian, 6 Western.

DISCHARGE TUBES OF He-Ne LASERS

Prague JEMNA MECHANIKA A OPTIKA in Czech Vol 24 No 3, Mar 79 pp 69-74

PETRU, FRANTISEK and VESELA, ZDENKA, Institute for Instrumentation Technology, Czechoslovak Academy of Sciences, Brno

[Abstract] The article in the March issue represents the first half of authors' publication. It will be completed in the April issue. Discharge tubes are the active part of the laser in which amplification is achieved by stimulated emission; they, together with the optical cavity characterize the properties of a laser. The authors designed discharge tubes for lasers of the type 2000 and 1450 operating in the TEM₀ mode. The hollow parts of the tube contain conical capillaries. The tubes are filled with methane at a pressure of 27 kPa. The laser operates at a line of 3.39 micrometers. The tube is made of fused quartz. It is pressurized automatically and continuously compensate for losses; neon is added periodically. Brewster's windows

are welded to the tubes at temperatures around 1000°C using a special solder. The tubes are 2000 and 1450 mm long respectively. The capillaries have a diameter of two to three mm. Vacuum for filling of the tubes reaches $2.5 \cdot 10^{-6}$ Pa; outgassing temperature is 350°C. The getters are made of barium. Figures 9; table 1.

HIGH-ENERGY DEVICES, OPTICS AND PHOTOGRAPHY

CZECHOSLOVAKIA

PRODUCTION TECHNIQUES AND PROPERTIES OF PLANAR DIELECTRIC OPTICAL WAVEGUIDES BASED ON PASSIVE AND ACTIVE MATERIALS

Prague SDELOVACI TECHNIKA in Czech Vol 26 No 8, Aug 78 pp 285-288

SCHROFEL, JOSEF

[Abstract] Planar dielectric optical waveguides are suitable for geometrically and physically defined transmission of an optical signal for short distances with a high energy efficiency. Their advantage is their very small size and their two-dimensional character. The guides consist of a substrate, a dielectric layer, and a cover layer. Materials for this application should be nonabsorbing, optically homogeneous and isotropic. Light propagation is governed by Maxwell's equations. Various behavioral patterns of their structure correspond to Snell's law. The entering light beam must be totally reflected on the dielectric layer-air and layer-substrate interfaces. Waves with multiple reflections must add into a single phase to avoid interference. Substances used in the production of the guides must have a suitable index of refraction, high permeability to transmitted light, be optically homogeneous, be easily shaped, have an adjustable index of refraction and have suitable piezoelectric, electrooptical and magneto-optical properties. According to the character of the index of refraction the waveguides are either uniform or graded-index. Materials frequently used for the layers are Ta_2O_5 , $LiTaO_3$, $LiNbO_3$, Y_2O_3 , $Be_{12}GeO_{20}$ and pure Al_2O_3 and SiO_2 . The substrate is a glass with a high SiO_2 content, such as SG 8329, 7059 of the Corning Glass Company, or pure fused quartz. The light source used by the author in his study was a light beam of a He-Ne laser with a wave length of 0.63 micrometers. The sputtering of the layer materials on the substrate was conducted under vacuum. The attenuation achieved experimentally by the author was 5 to 6 dB/cm, which is acceptable for many applications. Figures 6; tables 5; references 15: 3 Czech, 12 Western.

CZECHOSLOVAKIA

HIGH-ENERGY DEVICES, OPTICS AND PHOTOGRAPHY

UDC 621.373.5:621.382.2

NOISE CHARACTERISTICS OF MICROWAVE OSCILLATORS USING SEMICONDUCTOR DEVICES

Prague SLABOPROUDY OBZOR in Czech Vol 39 No 7, Jul 78 pp 285-291

HASAN, PAVEL, Institute of Radiotechnology and Electronics, Czechoslovak Academy of Sciences, Prague

[Abstract] Noise properties of microwave semiconductor oscillators are analyzed and the influence of synchronization on the reduction of the noise is discussed. The output of sidebands of noise modulation of microwave oscillators with Gunn and with breakdown diodes is lower than the output of sidebands of frequency noise modulation and can be usually ignored. Noise of FM oscillators with Gunn diodes is the same as that of high-quality klystrons but when breakdown diodes are used the side circuits must be adjusted. The diodes should be made of GaAs. In many applications the frequency of the microwave oscillator must be stabilized. Simplest method uses a connection of a high-Q cavity to the oscillation circuit of the basic oscillator. This arrangement has a limited time and temperature stability. The preferred method of stabilization is injection synchronization. The Q_{ex} of the cavity must have a low value. Improved stability is also obtained by connecting the phases to the signal of a low noise reference source. The cavity Q_{ex} should then have a high value. Figures 8; references 14: 3 Czech, 11 Western.

HIGH-ENERGY DEVICES, OPTICS AND PHOTOGRAPHY

CZECHOSLOVAKIA

UDC 621.374.3

LOSS-FREE CONTROL AND STABILIZATION OF HIGH PULSE VOLTAGES FOR MAGNETRON OR LASER SUPPLY

Prague SLABOPROUDY OBZOR in Czech Vol 39 No 7, Jul 78 pp 294-305

HLUBUCEK, VRATISLAV, Tesla Research Institute of Vacuum Electronics, Prague

[Abstract] The author studied the problem of control and stabilization of high pulse voltages. He developed a circuit with which the voltage can be regulated at ratios of 1 : 2. This ratio is sufficient for control of the voltage of the modulator for magnetrons in the primary side of a vn source. For laser sources the energy can be controlled nearly within a 1 : 4 ratio. This method of stabilization allows fast control of voltage impulses by a primary impulse and will not cause an amplitude modulation of impulses. It is suitable for controls following a prepared program, such as is needed in the start-up of a magnetron, and for increase in its output. The control is

practically free of energy losses because the energy not used in charging of the pulse line is returned from the charging to the feed circuit. The control circuit is stable and operates only on impulses. Control voltage can be adjusted to the anode loading of the charge. A source of a relatively low voltage can be used for resonance charging of the impulse line. Figures 8; table 1; references 8: 1 Czech, 3 Russian, 4 Western.

CSO: 1861

V - ETCHING: VERTICAL ANISOTROPIC ETCHING OF SILICON IN THE TECHNIQUE OF PRODUCTION OF SEMICONDUCTOR ELEMENTS AND INTEGRATED CIRCUITS

Prague SDELOVACI TECHNIKA in Czech Vol 26 No 10, Oct 78 pp 375-377

BETKO, TOMAS, KOCIS, IVAN, GULDAN, ARNOST, HRUBCIN, LADISLAV and VLADIMIR, A. C.

[Abstract] The V-etching technique is based on the selective action of a suitable etching agent on silicon in a definite crystallographic direction. The action in the direction perpendicular to the plane (100) is fastest. The etched structures then have a pyramidal shape and are limited by side planes (111), which meet in the shape of the letter "V." This technique is used in the production of bipolar and unipolar integrated circuits. Its use improves the parameters of speed, power consumption, density of elements on a chip, yield and price of the product. The US firm Raytheon was the first to use the V-etching technique V-ATE (vertical anisotropic etch) in 1971. They achieved a density of 80,000 transistors per cm^2 ; this was better than Fairchild could do with their "Isoplanar" technique. With the increasing number of bytes per chip the response time was also increased. The V-ATE technique overcame this problem and reduced the time of response to 35 ns. A brief review of the V-etch technique for bipolar and unipolar systems is presented. The V-etch technique is used in the production of memories by the V-MOS technique. The V-MOS circuits are cheaper than bipolar circuits. They also are faster. Figures 9; references 12 (Western).

UDC 621.882.55:629.7

SELFLOCKING NUTS IN AERONAUTICAL INDUSTRY

Prague CESKOSLOVENSKA STANDARDIZACE in Czech Vol 4 No 1, Jan 79 pp 8-12

HRKAL, VACLAV AERO, National Enterprise, Vodochody

[Abstract] Although selflocking nuts have been used in the aeronautical industry for 30 years, their development is still continuing. There are no universally suitable nuts; their construction should be simple, suitable for mass production, and their design should avoid stresses of the materials. Minimum tensile strength of the material is 980 MPa combined with a suitable notch strength. Czechoslovak steel L-ROL, similar to USSR Standard 30ChGSA is suitable for the purpose. Lowest acceptable strength of the material is 780 MPa. For nuts of threads of M3 to M14 the maximum moment for the first locking should vary from 69 to 1270 Ncm; the minimum moment of the fifteenth

locking should vary from 2.9 to 147 Ncm. The nuts should resist vibrations. Their tests should include fatigue and dynamic loads. 20 nuts should be used for the tests of a batch. Selflocking nuts will find applications in other industries, mainly the automobile and railway car manufacturing. Figures 4; table 1.

CSO: 1861

THERMAL CYCLES IN VESSEL WALLS

Prague STROJIRENSTVI in Czech Vol 28 No 10, Oct 78 pp 612-618

PLACAK, V., VLK, F., Research Institute for Equipment of Chemical Industry, Prague

[Abstract] The authors investigated stresses induced in the walls of high pressure vessels by temperature changes; both increases and decreases of temperatures were studied. Internal stresses in the walls pass through three stages: adjustment to the changed condition, increase in the deformation of the wall, and alternating plasticity. Equations for stresses leading to permanent deformation of the material are discussed. The design of a vessel should be selected so that both permanent deformation and alternating plasticity of the wall cross-section would be avoided. The authors prepared a graphical representation of the phase diagram which serves for the determination of the character of stresses in an investigated vessel wall. Figures 6; references 3 (Western).

CSO: 1861

A NEW LIQUID MANOMETER FOR CALIBRATIONS

Prague CESKOSLOVENSKA STANDARDIZACE in Czech Vol 3 No 11, Nov 78 pp 442-448

SKROVANEK, TOMAS, LANAK, DUSAN and KEPRT, ANTON, Czechoslovak Metrological Institute, Bratislava

[Abstract] Accuracy of pressure determinations using liquid mercury columns is a function of the accuracy of readings of the liquid levels. Czechoslovak Metrological Institute decided to design an accurate manometer, which was produced in 1975 and adjusted in 1976. The position of the liquid is measured electrically, and the length of the column interferometrically. The instrument is of the U shape type for measurements of pressures up to 0.1 MPa absolute or differential. The interferometer is based on a laser, the gas above pure mercury is pure nitrogen. Overall height of the instrument is 3.5 m, the internal tube has a diameter of 70 mm, the outer tube is concentric with diameters of 90 and 170 mm. The instrument holds about 6 liters of Hg. The thermometer for the control of mercury temperatures has an accuracy of 0.01°C. Overall inaccuracy at a pressure of 100,000 Pa is 0.206 Pa. The relative positions of the mercury columns are measured by means of electrical capacitance. Figures 10; table 1; references 10: 2 Russian, 8 Western.

ACCURATE MEASUREMENTS OF DIRECTION BY LASERS

Prague JEMNA MECHANIKA A OPTIKA in Czech Vol 23 No 10, Oct 78 pp 275-279

KUTIK, MILAN, Tesla Research Institute for Vacuum Technology, Prague

[Abstract] Lasers combined with electronic detectors can provide more accurate data than optical instrumentation measurements which are considered as standard at the present time. Lasers can be also connected to recording instruments and accurate data can be provided by this method. Control of operating equipment can also be provided by such lasers. The best lasers in this application are the He-Ne lasers operating on the red 633 nm line. The accuracy which can be obtained is on the order of 10^{-6} to 10^{-5} rad. This allows a linear accuracy of 0.01 mm. The technique is used in the measurements of deformation of machinery parts, changes in the condition of supporting structures of large buildings and bridges, and in the control of accuracy in the manufacture of large mechanical machinery such as rolling mills. Figures 9; references 8 (Czech).

ABSORPTION OF LIGHT RADIATION IN A HOLLOW GRAPHITE CONE

Prague JEMNA MECHANIKA A OPTIKA in Czech Vol 24 No 1, Jan 79 p 2

ELIAS, JURAJ, Institute of Measurements and Instrumentation Technology,
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[Abstract] One of the methods of determination of light output is based on the conversion of the light energy to heat in an absorption body and calorimetric determination of this heat. The absorption vessel of an optical calorimeter must not be selective to various kinds of light radiation, avoid local overheating, not be sensitive to small changes in the position of the absorption vessel and have a surface resistant to the absorbed radiation. The author designed such a vessel which consisted of a hollow graphite cone. It showed complete heat absorption, with practically determined values varying between 98.8 and 99.625 percent. The light source used in the calibration of the instrument was a gas He-Ne laser. The measurements were consistent within 0.003 percent of the determined values. Figures 3; table 1; references 4: 2 Czech, 2 Western.

PHOTOMETRY OF LIGHT EMITTING DIODES

Prague SDELOVACI TECHNIKA in Czech Vol 26 No 8, Aug 78 pp 293-295

HRIVNAK, IVAN

[Abstract] The author discusses basic photometric parameters of electronic equipment parts containing light emitting diodes. Experimental determination of optical parameters represents a difficult problem. It requires special equipment which is available only in some centers. The equipment parts reviewed are: Light emitting diodes (LED), Solid state lamps (LED lamps), seven segment LED display, and alphanumeric display. Because the perception of light and of colors is subjective, an objective system was developed by Comite International d'Eclairage. The light flow is expressed in lumens, light intensity in candles. Brightness is expressed in foot-lamberts. Photodetectors must reflect sensitivities of the human eye. Light emitting diodes are usually made of $\text{GaAs}_{0.6}\text{P}_{0.4}$ / GaAs. Their light is a practically monochromatic red light with a wavelength of 660 ± 15 nm. The angle of light emission of LED units is important; it is important to have a wide enough angle. They should reach full light intensity in 50 ns and be extinguished in 50-80 ns. Their life is 50,000 to 200,000 hours. Figures 4; references 8: 3 Czech, 5 Western.

DIGITAL INTEGRATED CIRCUITS OF THE MZ100 SERIES

Prague SDELOVACI TECHNIKA in Czech Vol 26 No 8, Aug 78 pp 297-304

HYANEK, KAREL and MACHALIK, LUDVIK

[Abstract] The digital integrated circuits of the MZ100 series are the product of TESLA, Roznov; they are monolithic integrated circuits of the DTL type, resistant to interference with a typical delay of signal transmission of 200 ns. They are provided with a Zener diode at the input and have a large capacity of the input transistor which provides them with very good static and dynamic resistance to interference. Input voltage is 12 to 15 V. Casings of the circuits are provided with 14 or 16 leads in dual lines. They conform to Czechoslovak Standards NR-K 028 and 358031. The delay can be slowed down and this offers dynamic resistance to interference. Special geometry of the input transistor provides a high collector capacity resulting in long "on" times, and a high dynamic immunity from interference. The period of signal delay can be increased from the original 200 ns to two microseconds. The circuits are provided with two resistance output levels: 20 and 400 ohms. The circuits of the series are: MZH 115 with four dual NAND logic elements, two of which have a lead for connection to integrated capacitors. The MZH 145 has five dual NAND logic input elements with leads for connections to integration capacity. MZH 165 and MZH 185 have five dual NAND logic elements with open connection leads. Two types of flip-flop circuits are available in this circuit series: one with three inputs, and one which is monostable and designed for variations of the input impulse. Applications of the MZ100 series circuits are based on their logical function. They are suitable for astable and monostable multivibrators. The DC parameters of the circuits are similar to those of TTL circuits. They are designed for transmission of information to greater distances. Figures 26; tables 14.

NEW DIRECT-READING PHASE METERS

Prague SDELOVACI TECHNIKA in Czech Vol 26 No 8, Aug 78 pp 311-312

Nk [Author's full name not given]

[Abstract] Metra, Blansko National Enterprise produces a direct-reading phase meter PU 440. Its design is based on Czechoslovak Patent 146089. It is used to measure phase angles between voltages of $U_1 = 220$ V and $U_2 = 2.5$ to 100 V. The range of U_2 voltages can be adjusted to 0.1 to 5 V by means of a built-in adapter. Frequencies of 50 to 300 Hz are suitable. Accuracy is 2.5 percent of the scale. Voltage of 12 V is needed when the instrument operates in the lower voltage range. Current of 10 mA is then needed. Otherwise the instrument does not require outside power source. Inlet connection 1 needs power supply of 2.7 VA, inlet 2 needs $3.5 \cdot 10^{-3}$ VA. The instrument is available in a standard Metra case. For more accurate measurements the author recommends the USSR phase meter OMIIT (name of a Soviet University). This can measure phase angles of $\pm 180^\circ$ between voltages of 0.5 and 380 V at frequencies of 20 to 2000 Hz. Line power supply at 220 V / 50 Hz or from a 9V battery is needed for the instrument. Figures 3; references 2: 1 Czech, 1 Russian.

A SCANNING ELECTRON MICROSCOPE WITH A FIELD EMISSION GUN

Prague SLABOPROUDY OBZOR in Czech Vol 39 No 10, Oct 78 pp 443-450

DELONG, ARMIN, Associate Member of Czechoslovak Academy of Sciences, DRAHOS, VLADIMIR, KOLARIK, VLADIMIR, LENC, MICHAL, HLADIL, KAREL and SALEK, ROBERT, Institute of Instrumentation Technology, Czechoslovak Academy of Sciences, Brno

[Abstract] The authors describe a new instrument which they developed for a combination of microscopic examination and analytical examination of samples. The electron gun used in the instrument uses a field emission source, which in the past was available only in experimental quantum physics. The vacuum used is 10^{-6} to 10^{-8} Pa, several orders of magnitude better than what was considered achievable in standard instruments. The emission current is on the order of 5 micro-amperes and the cathode remains stable for several hours. X-ray spectroscopy for elemental microanalysis uses characteristic X-radiation and Auger electrons. Acceleration voltage is available at one, four, nine, 16 and 25 kV. The instrument was developed for the study of solid state surfaces. Figures 11; references 3: 1 Czech, 2 Western.

METHOD OF EXAMINING SPINAL EVOKED POTENTIALS

Leipzig PSYCHIATRIE, NEUROLOGIE UND MEDIZINISCHE PSYCHOLOGIE in German
Vol 31 No 3, Mar 79 pp 144-147

REICHEL, Gerhard, Dr, docent and LANG, Guenter, Dr, docent; Ernst-Moritz-Arndt University, Griefswald, Neurological Clinic and Surgical Clinic, Department of Neurosurgery

[Abstract] A new method is described for producing evoked spinal potentials (SEP). Unipolar needle electrodes, isolated with teflon up to their tip, 60 mm long and 0.7 mm in diameter were employed using a technique similar to the method used in discography. The electrodes are introduced percutaneously and ventrolaterally into the cervical disc (optimal height C4/5) up to the dorsal longitudinal band. SEP is conducted following stimulation of the median, ulnar and tibial nerves with surface electrodes. Impulses of 0.2 millisecc. duration and a current intensity below the pain threshold are used. After stimulation of the median or ulnar nerve at the wrist, a mostly bi-or triphasic action potential of 5-10 microV intensity appears after about 10 millisecc. After stimulation of the tibial nerve, the potential appears after 20 millisecc., is mostly polyphasic and its intensity is only 0.5-1.5 microV. The SEP is reproducible with respect to both latency and phase number. The difference in intensity between upper and lower limb stimulation suggests that, after stimulation of the arm, the root potentials appear in the SEP while, after leg stimulation, SEP is formed by stimulation of the long pathways. The brief latency periods underline the radiculo-spinal origin of these evoked potentials as opposed to reflex potentials. The presence of a spinal potential after stimulation of the arm or leg nerves excludes the presence of a complete horizontal spinal lesion, or the severance of the peripheral nerve or plexus. Figures 3; references 20: 5 GDR, 2 Russian, 13 Western.

CSO: 1840

EXPERIENCE WITH AND INVESTIGATIONS USING A POLISH ABBREVIATED FORM (DKO/74)
OF THE MINNESOTA MULTIPHASIC PERSONALITY INVENTORY

Leipzig PSYCHIATRIE, NEUROLOGIE UND MEDIZINISCHE PSYCHOLOGIE in German Vol 31
No 3, Mar 79 pp 157-167

LITTMANN, Eckhard, psychologist and SANOCKI, Wlodislaw, Dr Charite, Department of Medicine, Neurological Clinic, of Humboldt University in Berlin, and Institute of Psychoneurology, Warsaw

[Abstract] The advantages and drawbacks of the MMPI are discussed. Mentioned among its weaknesses are the problems of translation and adaptation of the test into a foreign-language as well as its dependence on ideological and societal norms. The time requirement makes its use uneconomical and also makes it difficult to administer to psychiatric patients. The development, standardization and normalization of an abbreviated form, DKO/74, in Poland is reported. It involved the elimination of all items which were counted in more than one scale in the original form, the elimination of all items which were not associated with any of the MMPI standard scales, and disregarding of the Mf and Si scales. The questions thus reduced in number were classified into two empirical validity scales (L/K and F) and eight clinical scales according to the key of the original test. Standardization was made using 570 male and 200 female subjects. Investigations were conducted on groups of Polish and GDR patients to test the reliability of the method in establishing clinical diagnoses. The groups included schizophrenics, neurotics, alcoholics, oncological patients and criminal offenders. The results of these as well as of studies on factorial validity are presented in detail. These indicate that the test is well suited for clinical and psychodiagnostic examinations. Figure 1; references 20: 11 GDR, 1 Polish, 8 Western.

CSO: 1840

SUICIDAL ATTEMPTS BY TAKING AN OVERDOSE OF PILLS

Leipzig PSYCHIATRIE, NEUROLOGIE UND MEDIZINISCHE PSYCHOLOGIE in German
Vol 31 No 3, Mar 79 pp 174-183

SPAETE, Helmut, F., Dr, docent and OTTO, Klaus, Dr, Bezirk Hospital for
Psychiatry and Neurology, Bernburg [GDR]

[Abstract] The study was conducted on 352 subjects who had been treated at the consultation for suicidal patients over a 3 year period. They had used pills for their attempted suicide. Age and sex distribution, the number and origin of the pills used as well as their use in combination with alcohol or other means of destruction were examined. Women used pills alone much more frequently than men. They also took fewer pills on the average. Combination of pills and alcohol predominated in men. Young patients of both sexes frequently used pills alone. The middle aged combined pills with alcohol and other methods. Suicidal use of pills was rare among the aged. The distribution of the type of pills used is presented in Figure 1. Pills were selected with an apparent disregard to their mode of action. More men and young people took pills that "were around" while more women and aged patients used prescriptions filled within 3 months before their attempt. Purchase of pills for suicidal purposes was negligible. The number of pills taken or the combination with other means of suicide had no correlation with the seriousness of intent. Since most of the pills used for suicidal attempts were available on prescription, physicians are advised to be aware of this fact and certain recommendations are made concerning the more restrained and circumspect handing out of prescriptions. References 28: 9 GDR, 19 Western.

CSO: 1840

DECREE ESTABLISHES FUNCTIONS, MAKEUP, JURISDICTION OF ACADEMY OF SCIENCES

Budapest AKADEMIAI KOZLONY in Hungarian 14 May 79 pp 67-70

[Text of Law Decree, issued by Council of Minister, Number 6 of 1979 concerning the Academy of Sciences]

[Text] 1. The Hungarian Academy of Sciences (henceforth the Academy) is the highest scientific organ of the Hungarian People's Republic.

2. (1) With the activity of its members and with continuing research in its institutions, with its principled and methodological directing of research, with its development of relations between theory and practice, with its assurance of scientific research freedom and its fostering of democracy in scientific public life, the Academy takes care of the creative cultivation of science. Through its activity it contributes to the development of the Hungarian People's Republic and to the advancement of science and universal humanitarian interests.

(2) The Academy participates in the national direction of scientific research, in the formulation, execution and supervision of national research policy; it aids in harmonizing research efforts, it follows with attention and interest scientific development with special attention to research establishing future development; it works out advance indications, concepts and guidelines for the advancement of domestic science.

(3) At the request of the Council of Ministers, or high-level state or social organs, and based on its own decisions, the Academy gives its opinion and makes recommendations in questions of great importance concerning science and socioeconomic development.

3. The Academy participates in directing the training of the next scientific generations, in scientific classification, international scientific relations, in directing and developing the publication of scientific books and periodicals.

4. (1) The Academy, with the cooperation of its members, administers its sphere of duties as a unit by means of its scientific bodies, institutes and official organizations. Its organization and operational guidelines are determined by the basic statutes.

(2) The domestic and foreign members of the Academy are chosen by the general assembly. The domestic members take part in the cultivation of science, scientific public life and the administration of duties.

(3) The organizational bodies of the Academy are the general assembly—its highest organ—and the other organs determined by its statutes.

(4) To administer the duties of the Academy, it maintains or establishes scientific research and other institutes. It organizes research and supports institutions functioning under the supervision of the national ministries and organs in Agreement with the supervising authority.

(5) The official organization of the Academy cooperates in directing the activity of its institutions, carries out the planning and procedural work necessary for the cooperation of the bodies and administers managerial duties involved in the national direction of research.

5. In the interest of developing scientific activity and make known the results, the Academy supports organizations and societies with scientific goals.

The Academy organizes congresses, scientific sessions and other programs for the purposes of making known the results of scientific research and stimulating debate on scientific questions.

6. Special chapters must be provided in the state budget to meet the operational expenses of the Academy.

7. (1) The president directs the activity of the scientific bodies of the Academy. The president is chosen for a specific term from among the members and is confirmed by the Presidential Council of the Hungarian People's Republic. The president is responsible for his actions to the general assembly and Council of Ministers.

(2) The vice presidents assist the president in the work. The vice presidents are chosen from among the members of the Academy for a specific term and are responsible for their actions to the general assembly.

(3) The general assembly has the power to recall the president and vice presidents during their terms. The approval of the Presidential Council of the Hungarian People's Republic to recall the president.

8. (1) The tasks of the Academy in the national directing and harmonizing of research as well as the directing of its institutes--taking into account the opinion and recommendations of group organs--are administered through the chief secretary. The chief secretary confirmed by this law acts in his jurisdiction and in the legal position of leader of a national effective organization on the basis of the authority of the Council of Ministers.

(2) The chief secretary directs the official organization of the Academy, is in charge of operation of the groups of the Academy and of personal and material conditions of the continuing research in its institutes.

(3) The Council of Ministers elects the chief secretary for a limited term from among the members of the Academy on the recommendation of the general assembly. He is responsible to the Council of Ministers for his actions; he gives an account of his work to the general assembly and to the presidium; he is obliged to state his reasons for measures which deviate from the recommendation or opinion of the group organizations.

(4) The deputy chief secretaries help the chief secretary in his work. The Council of Ministers names the deputy chief secretaries from among the members of the Academy on the recommendation of the general assembly.

(5) The Council of Ministers, on the recommendation of, or with the approval of the General assembly, can relieve the chief and deputy chief secretaries during their determined term of office.

9. The chosen and appointed leaders of the Academy cooperatively administer the tasks of the Academy.

10. (1) The Council of Ministers of the Hungarian People's Republic exercises supervision over the operation of the Academy.

(2) The Council of Ministers within its legal jurisdiction designates those tasks which belong to the Academy in directing scientific life and national research. It approves basic statutes accepted by the general assembly and supervises the activity of the Academy.

11. (1) The Academy, the ministries and the organs of national authority mutually inform each other concerning the administration of their duties.

(2) The leaders of the organs of national authority and the ministers decide, on matters significantly influencing research activity going on in the nation after hearing from the bodies of the Academy and the chief secretary.

(3) The Academy, in significant matters of national economic research proceeds in harmony with the branch ministries and the chief secretary and decide after hearing from the branch ministries.

(4) The bodies of the Academy are represented by the president, the official organs and institutes by the chief secretary and act in agreement in the general representation of the Academy.

Since the 1969, No 41 decree of the Hungarian Academy of Sciences has gone into effect, the role of science in society has increased. The responsibility and significance of the Academy, as the highest scientific forum and national directing organ has grown. Recognizing the claim that the indispensable condition for national economic development is the growth in efficiency of scientific research and technical advances, the Academy in accord to the expectations of society, takes on an ever-increasing share of solving the tasks related to increasing the role of science in society. An increased role falls to the Academy in the work of certain areas of science and research to determine future development, in giving national direction to research and in coordinating it and in fostering international scientific relations.

All this indicates that the Hungarian Academy of Sciences, as an national effective organ is today not only directing the research institutes under its supervision, but in this capacity administers national research guidance and coordination tasks.

The increased duties of the Hungarian Academy of Sciences have indeed made necessary the redrafting of those legal frameworks which stipulate the legal position, authority, obligations and licenses of the Academy.

Detailed Justification

1. In the interest of realizing the goals mentioned in the general justification, the bill states that the Hungarian Academy of Sciences is the chief scientific organ of the Hungarian People's Republic. The Academy is responsible for the creative cultivation of science by the work of its members, the ongoing research in the institutes, the principled and methodological guiding of research, the development of relationships between theory and practice, the insuring of freedom for scientific research and the fostering of the democracy of scientific life. This creative activity insures that science will serve the development of the Hungarian People's Republic and the advancement of science.

2. In indicating concrete duties, the bill gives special emphasis of participation in directing national scientific research, to working out national research plans and to cooperate in their execution and supervision, to coordinate research and determine research for scientific development, to set goals and guidelines. [2/2]

3. The range of duties of the Academy are administered by its own organizational structure in cooperation with its members of its scientific bodies and its institutes. This characteristic, however, does not affect the

unity of the Academy according to which the role and duties of Academy organizations are formulated. (4, 1 & 5) In the administration of duties a significant role falls to the research and other institutes established through the Academy as well as to research institutes supported by the Academy and operating under the supervision of organs of national authority. (4,4) A part of the goal of the Academy is realized by the support of scientific organizations and societies and the organization of scientific congresses, meetings and other programs. (5)

4. The effective decree distinguishes between official, regular and certified members of the Academy. The latter are domestic scholars whereas official members are foreigners chosen by the general assembly. The bill differs from older traditions by employing the terms "domestic and foreign members." (4,2 introduction)

Similar to earlier regulations the bill disregards the listing of organs of the Academy, but stresses the general assembly as the highest organ. The naming of the other organs and determining the operation forms can take place of the basic regulations (4,3 introduction).

5. The president of the Academy, as the director of operations of the scientific bodies, is chosen by the general assembly and confirmed by the Presidential Council of the Hungarian People's Republic. The president is responsible for his actions to the general assembly. At the same time, in the interest of strengthening state responsibility, the bill determines the responsibility of the president before the Council of Ministers (7.)

6. The bill puts the duties and authorities of the chief secretary of the Academy into complete harmony with the increased and broadened duties of the Academy in directing national research. The chief secretary, as the leader of a national authorized organ, administers his activity by taking into account the opinion and recommendations of the organs and must justify his actions when he strays from these. (8.)

7. Concerning the determination of duties of the Academy and in indicating of organizational structure, the stressed unity is evident in the fact that the chosen leaders of the Academy cooperatively administer the tasks falling to them in directing the Academy. (9.)

8. The bill gives more detailed regulations for the forms of cooperation of the Academy as well for as the ministries and organs of national authority than the decree in effect. The essence of cooperation is mutual briefings, coordination of qualified academic, and ministerial viewpoints in the interest of increasing harmony in scientific and national economic activity. (11.)

9. The bill waives that provision of the earlier decree which the members of the Academy in this capacity share in academic pay. The determination of this seems sufficient in the basic regulations which are approved by the Council of Ministers.

PRESENT, FUTURE ORION MODEMS DESCRIBED

Budapest SZAMITASTECHNIKA in Hungarian No 6, Jun 79 p 4

[Article by Lajos Nobik: "ORION Data Transmission Modems; The Chief Achievements of 10 Years of Development and the New Types Being Prepared"]

[Text] Within the sphere of domestic computer technology applications we can meet ever more frequently with data transmission modems (modulator-demodulators). The modems ensure the transmission of digital data over distances virtually at will. Thus modems are as indispensable to remote data processing systems as, for example, amplifiers in audio frequency technology. To stick with the simile, we could see the development of Hi-Fi solutions in amplifier technology; in the same way we can see how the capacity of the data transmission modems is increasing. This means that in a given transmission channel, the 3 kilohertz band of an audio frequency telephone channel, for example, we have come from the original 200 bits per second speed to a speed of 9,600 bits per second or to the transmission of 2 x 1,200 bits per second over a duplex double line, including the complex diagnostic capabilities required by modern network control, etc. We might mention as a curiosity that they have even developed modems with speeds of 16 Kbits per second for the digital transmission of speech signals (the Plessey firm in England).

The extraordinarily swift development and spread of data transmission was made possible not only by the increased needs but, not least of all, by the fact that it relied on a possibility which existed throughout the world--the very extensive telephone network which reached an age of 100 years in the meantime. In an understandable way this also imposed limitations because telephone technology, developed in accordance with the requirements for speech transmission, limits the increase in data transmission efficiency, including the transmission of undistorted information, because of the slowness of the switching structure and the great spread in transmission parameters. We can still say, however, that despite the introduction of data networks specially created for data transmission purposes, which has begun, data transmission by telephone line will be a realistic solution for a long time still because for a long time the spread of the new data networks will not reach the density of the existing telephone networks. The line system structure of the data networks will continue to require telephone line modems to ensure a link into

the network. And, finally, it is not only the computers which must talk to one another; the people operating the computers must talk to one another too. So the alternative speech transmission possibility of telephone line data transmission is a service not to be underestimated, especially in the initial phase of data processing when there is not that experience in operating remote data stations which might dispense with direct speech contact.

Looking back over the past 10 years, the domestic spread of remote data processing began late and relatively slowly. According to our experience the chief reason for this was that only in the middle 1970's did ESZR [Uniform Computer Technology System] computer multiplexors appear on the market, and these are necessary for handling modem data links. It is not by chance that the GDR market appeared as the first customer for Hungarian data transmission equipment because, linking up with the E-1040 computer, the Robotron Kombinat began to deliver the MPD-4 multiplexors in 1975. Thus there has been a market, essentially since 1975, for the 600/1,200 bit per second data transmission modems, together with the off-line punch tape data stations operating primarily at a speed of 200 bits per second, and only recently has there been an increasing demand for 1,200/2,400 bit per second modems. At present there are only ad hoc applications requirements for modems of faster speed and measurement data is not available for the transmission parameters of such links.

At the beginning of 1972 ORION approved its AM-1200 modem with a speed of 600/1,200 bits per second, code number ESZ-8006, which had been developed jointly with the Central Physics Research Institute. This approval involved the first joint international testing for EXZR remote data processing equipment.

After successful testing of the AM-1200 modem, international testing of the ORION AM-2400 modem, with a speed of 1,200/2,400 bits per second, code number ESZ-8011, developed jointly with the Telecommunications Research Institute, began in December 1973. This was based on the need for a conversational set which would be suitable for data transmission and speech transmission on a link which included direct (leased) distant sections. As the result of the developmental work which began then they approved in 1976 the MOHA-96 calling and speaking set, code number ESZ-8070, in accordance with the technical requirements worked out by ORION.

All three of these ORION instruments (the AM-1200, the AM-2400 and the MOHA-96) were exhibited in Minsk, in the Soviet Union, in June 1977 in the ESZ-7920 equipment family system supported by an ESZ-1035 computer and an MDP-3 multiplexor. The equipment worked perfectly in this real computer environment, confirming the positive results of earlier independent tests.

We have thus far touched on a few general questions of data transmission and on the development of three ORION instruments. Turning to applications of the equipment we must first of all the requirements that appeared for data transmission links for the AP-62 and AP-64 picture tube data stations manufactured by ORION. The picture tube terminals, as the most direct means for human-machine links, posed serious requirements in regard to the speed of data

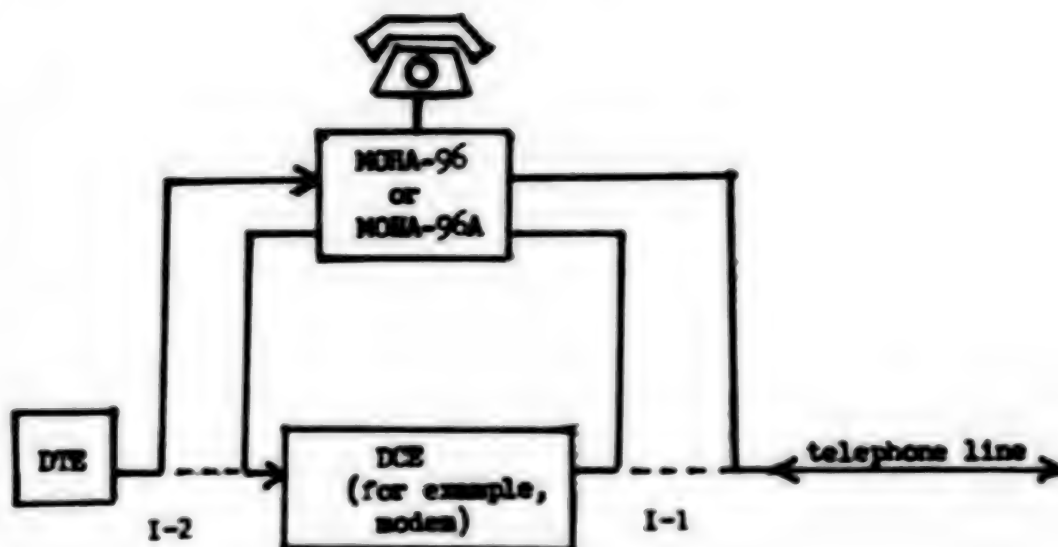
transmission, that is the minimal value of response time, because of the conversational link. This can be provided, on the one hand, by modems of greater speed and, on the other hand, by zero delay duplex or full duplex links. On the basis of this double requirement there are two developmental plans in an advanced stage of development—ORION is working on the development of a completely new type of duplex 2 x 1,200 bit per second modem, the AM-12TD. This modem, with code number ESZ-8007, is one of the newest members of the ESZR remote data processing equipment family and international testing can be expected this year. The increase in speed will be realized by the ORION AM-4800 modem, with a speed of 4,800 bits per second, code number ESZ-8081, being developed jointly by ORION and the Telecommunications Research Institute. The modern microprocessor system of the AM-4800 modem represents an entirely new generation among the ORION modems and simultaneous with its development a new 2,400 bit per second modem will appear on the basis of the family principle.

Table:

ORION MODEM	Obsolescent	Modernized		New types under development			
	AM-1200	AM-1201	AM-1201 OEM	AM-2400	AM-12TD	AM-2401	AM-4800
Speed bit/sec	600/1,200			2,400/ 1,200	2 x 1200 (2 x 600)	2,400/ 1,200	4,800/ 2,400
Information trans- mission mode	Anisochronal: 0-600 bit/sec 0-1,200 bit/sec Isochronal: 600 or 1,200 bit/sec			Iso- chronal	Iso- chronal or start- stop character	Iso- chronal	Iso- chronal
CCITT proposals	V.23, V.24 and V.28 or V.25 V.54			V.26, V.24 V.28, V.54	V.22, V.24 V.25, V.28 V.54	V.26 bis V.26, V.25 V.24	V.27 bis V.27, V.24, V.28 and V.54
ESZR code num- ber	ESZ-8006			ESZ- 8011	ESZ- 8007	ESZ- 8013	ESZ- 8018
Modulation	FSK			DPSK 4 phase		DPSK 8 phase	
Line trans- mission	2 line semi-duplex or 4 line full duplex			2 line full duplex		2 line semi- duplex or 4 line full du- plex	
Line conditions	Connected telephone network or direct (leased) telephone line			Direct tele- phone line of M.1020 quality	Connected network	Connected network	Direct tele- phone line
Technology	Normal TTL			Normal TTL or LS TTL		Microprocessor	
Manufacture begun	1973	1980		1976	1980	1981	

In contrast to the AM-2400 type now being manufactured and suitable only for a direct link this new AM-2401 modem will work on a connected telephone network in accordance with the ESZ-8013 technical requirements.

Diagram 1.



The accompanying table shows the basic characteristics of the equipment described. The table includes the AM-1201 type along with the AM-1200 modem; it is a modernized and expanded version of the AM-1200. One new feature is the card construction of the AM-1201; it uses six 140-150 mm ESZR cards and makes possible so-called OEM applications.

Before describing the various types we must emphasize the increasing importance of the diagnostic capabilities of the modems; in addition to reliable construction these capabilities represent the most important operational property. Proposal V.54 was accepted at the Sixth Plenary Session of the CCITT in 1976; this proposal prescribes standard solutions for various test loops. The AM-1201 and AM-2400 modems satisfy the V.54 proposal in its entirety while the AM-12TD is also suitable for automatic remote loop linkage. The diagnostic signals in the new types make possible a quick review of the state of the interface circuits.

ESZ-8086; ORION AM-1201

The asynchronous modular system of the AM-1201 makes possible the transmission or receiving of anisochronal, linear, binary data at speeds of 600 or 1,200 bits per second on an open connected telephone network or on direct (leased) 2 or 4 line telephone type circuit. The modem operates on a two line circuit in a single directional (semi-duplex) mode and on a four line circuit in a simultaneous two directional (full duplex) mode. On a connected network a

"call handling unit" (MHK-A) connected to the modem sets the modem for automatic or manual response or makes possible reception in the speech mode independent of interface control. In the case of a direct circuit a supplementary unit working with the modem (the MOHA-96 calling and speaking set) ensures the transmission and reception of signals as an alternative to data transmission or carrying out conversations.

The 140-150 mm card units of the AM-1201 are placed in a closed box. The closed front panel of the table box has only lamps indicating the linkage state and the alarm state of the line signal detector used plus push buttons for linking into the loop. The necessary connections can be made with fittings on the back of the box.

With a consistent application of the family principle the AM-1201 modem shows a close connection to the AM-2400 modem; in addition to the same box construction they have common network feed units, line connection and synchronization units, and complete control channel blocks.

ESZ-8011: ORION AM-2400

The synchronous modulation system of the AM-2400 makes possible the transmission and reception of isochronal, linear, binary data at speeds of 2,400 or 1,200 bits per second with differential phase state modulation on direct (leased) 2 or 4 line telephone type circuits. The line equalizer of the modem which can be inserted makes possible operation even on lines of poorer quality than defined in proposal M.1020. A supplementary unit working with the modem, the MOHA-96 calling and speaking set, ensures the transmission and reception of signals as an alternative to data transmission or carrying out conversations.

The swift synchronous control system of the AM-2400 is very suitable for so-called multiple-point network operation when one control modem is working with several controlled modems in the query mode.

In case of need one can simply plug into the modem the control channel units, common to the AM-1201 modem, and units containing interface control.

ESZ-8070: ORION MOHA-96

In the case of 2 or 4 line direct (leased) telephone type circuits the MOHA-96 calling and speaking set ensures the transmission and reception of signals and the carrying out of conversations. It is a special feature of the set that it works with data transmission modems and when the station called is in the data mode it still ensures the reception of call signals.

The construction of the MOHA-96 makes it possible for it to work with any modem which meets ESZR requirements and/or the CCITT proposals and so its applications are not limited to the ORION modems. By using the MOHA-96 the user can save the costs of telephone conversations which are generally necessary with a data link.

The MOHA-96 consists of two main parts: an independent table electronic unit and a CB type postal dial telephone set.

Diagram 1 shows the connections for the MOHA-96 and the equipment for the cooperating data circuit (for example, a modem) between the I-1 (telephone line) and the I-2 (data side) interfaces. The cooperation of the MOHA-96 and the modem is realized on the I-2 and I-1 interface in such a way that by pressing the ground button of the telephone set and lifting or replacing the handset the telephone line can be switched to the MOHA-96 (speech mode) or returned to the modem line for the data mode. In the speech mode the MOHA-96 calls the other station by transmitting a single frequency signal. Selective reception of the single frequency signal is possible at the station called in both the data mode and the speech mode.

One can distinguish the following four chief phases of operation:

- Data transmission,
- Single frequency signal transmission,
- Speech transmission, and
- Single frequency signal reception.

The MOHA-96 has an independent table electronic unit in a closed box which can be placed at a maximum of 15 meters from the cooperating modem. The dial CB telephone set can be placed on top of the set or at some distance from it (for example, at the operator's station). Indicator lamps on the front panel of the set show the operational mode at the time (In, Call, Data and Speech).

The signal system and speech transmission service of the MOHA-96 make possible independent use regardless of the modem link, for example to take the place of a traditional LB telephone. In many cases the four line link possibility represents an advantage for such applications, as does the single frequency signal transmission solution within the band, for it makes unnecessary the use of the signal transforming equipment necessary in the case of an LB set.

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CSO: 2502

HUNGARY'S POSITION IN THE UNIFIED COMPUTER SYSTEM ASSESSED

Budapest HETI VILAGGAZDASAG in Hungarian No 6, 14 Jul 79 pp 18-19

[Excerpts] The collaboration of the socialist countries in the production of computers, after first concentrating on data processing equipment, has now switched to installations which control production. According to a survey, every third Hungarian enterprise makes regular use of the benefits offered by computer technology. Hungary expects to spend between 11 billion - 12 billion forints on acquisition of computer technology equipment between 1976-1980. The enterprises and institutions will spend nearly half this sum on domestically produced computers and 60 percent on imported. By 1980 there will be approximately 720 computers in Hungary as compared to 120 in 1970. The sources of this sizeable computer park and, chiefly, the cost are not matters of indifference to the country.

It was exactly 10 years ago that the ESR [Unified Computer System] was established, the members of which were the USSR, Bulgaria, Czechoslovakia, Poland, the GDR and Hungary. Romania and Cuba joined the organization later. As is known, the Interstate Committee for Computer Technology set up within the framework of the ESR coordinates the development of computer technology equipment and its production through international division of labor. The first operational system came into being in 1972. The so-called ESR I series was ready in 1973; its elements can be used to meet the most urgent needs of the member nations for computer technology equipment.

Work distribution is as follows: The R-50 was developed and is produced by the USSR; the R-30 and R-33 are also Soviet products; the R-20 and R-22 are the result of Soviet-Bulgarian cooperation; Czechoslovakia makes the R-21 while Hungary specializes in the smallest member of the series, the R-10, R-11 and R-12. The R-10 is a small computer in name only, and the demand for it is rather great. Between 1971-1978 its producer, the Videoton Factory shipped 490 such computers to countries belonging to the ESR. This accounted for 65 percent of the total export traffic of the enterprise. Naturally appropriate peripherals such as displays, memories and line printers are produced in addition to the actual computers. Half of our computer technology production, the value of which will amount to 4.6 billion forints this year, consists of such peripherals, and 80-85 percent of them are exported.

Development of the ESR II series has now been completed. This means also that updated, higher capacity version of the units in series I are now on display at the Moscow exhibition.

There is growing need nowadays for small specialized computers designed to deal with individual problems. The small computers made in Hungary are only partly suitable for meeting such demand. The MSZR [Minicomputer System] was established in 1974. It harmonized the development and production of computers of limited usability, and relatively small capacity such as are used for control of production processes, automation of laboratory experiments, and mechanization of management of small enterprises. There are four computers in the so-called first series of the MSZR, and they are made on the basis of Soviet plans through Polish, Cuban, Romanian and Czechoslovak cooperation. Hungary has joined this program, which will terminate in 1979, by producing peripherals. The second MSZR series will be ready by 1982, and Hungary will participate in it through a computer already developed at Videoton, the high-performance MEGZMINI, SZM-52.

The question may arise of whether or not the arrival of the MSZR on the market is damaging the market for the domestic computer technology industry. This concern is exaggerated according to domestic authorities, because Hungary has developed peripherals primarily for the ESR which are compatible with the minicomputer systems, and the demand for them will merely increase. At the same time, the updated versions of the R-10 have found favor with buyers who have largely tied up the capacity of the Videoton Computer Technology Factory through long-term contracts. Furthermore, the experience acquired during the serial production of this series could be applied in development of the SZM-52, the only minicomputer on which the programs designed for the R-10 can be run.

The MSZR products of the Hungarian computer industry are featured at the Moscow exhibit performing in combinations which not only control technological process but help in management, inventory control, bookkeeping of enterprises.

The optimistic mood of the jubilee exhibition left little time for discussion of problems. This does not mean that those concerned are unaware of them. As one Soviet minister commented: "We have the piano, now all we need is the score." He was referring to the present shortage of software in the ESR.

CSO: 2502

DYE LASERS WITH DISTRIBUTED FEEDBACK

Budapest KEP ES HANGTECHNIKA in Hungaria: Vol 25 No 1, 1979 pp 21-22

BOR, ZSOLT; RACZ, BELA; KETSKEMETI, ISTVAN and KOZMA, LASZLO, Chair for Experimental Physics of the Jozsef Attila University of Sciences, Szeged

[Abstract] Dye lasers with distributed feedback possess excellent tunability and a simple structure. During the study of the properties of nitrogen-laser-pumped dye lasers with distributed feedback it was found that the use of an external resonator mirror improves considerably the properties of prismatic dye lasers. As a result of the theoretical and experimental examination of the time dependence of this type of laser a new method was developed for creating ultrashort pulses in the subnanosecond range, whereby the average lifetime of the photons must be considerably shorter than the lifetime of the excited state. This can be achieved by using a short active medium and a low-reflection mirror. Figures 4; references 4: 2 Western, 2 Hungarian.

CSO: 1861

DETERMINATION OF THE OPTIMUM THRUST ANGLE AND DESIGNING OF THE MINIMUM DIMENSIONS OF A CONTROL PATH

Budapest GEP in Hungarian Vol 30 No 11, Oct 78 pp 423-427

KORVATH, LASZLO, graduate mechanical engineer, Machine-Manufacturing Unit of United Incandescent Lamp Works, Budapest

[Abstract] In designing control paths, when the task is to select the optimum parameters, the designers may make use of the expressions and diagrams provided for establishing the optimum thrust angle quickly and accurately. Once the optimum thrust angle is known, the method of designing described permits the establishment of the most suitable control-disk dimensions for the movement involved. The expressions, diagrams, and designing methods presented take jointly into consideration the geometrical dimensions involved, the efficiency of the mechanism, and the forces that bear on the structure. The thrust angle is defined as the angle between the normal of the control path and the movement direction of the moved part. It affects significantly the operation of the control path and the performance of the actuated mechanism. To ensure that the basic dimensions of the control path are minimum, and that the magnitude and nature of the forces are optimum, the thrust angle should not be the permitted maximum but at the optimum level, as established by means of the procedures described. Figures 6; table 1; references 3: 1 Russian, 2 Hungarian.

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USE OF ROBOTS IN WELDING TECHNOLOGY

Budapest GEP in Hungarian Vol 31 No 2, Feb 79 pp 74-80

SZOKOL, GYORGY, Dr, graduate mechanical engineer, graduate welding engineer

[Abstract] There are basically two types of robot used in welding technology: point-controlled and path-controlled types. The characteristics of the welding robots used predominantly in Europe (ESAB-ASEA, Hobart Trallfa, Kuka Nachi, Cloos Unimate, BOC HAL, and SAF Robolang) are briefly described, and application examples are discussed. Most welding robots in use today perform resistance welding, and the major user is the automobile-manufacturing industry. The tolerance of ± 1 mm specified in this industry can be dependably met. Welding robots performing arc welding continue to gain ground. For this use, point-controlled robots are more suitable than path-controlled robots. One robot, as a rule, performs the work of 3-4 skilled welders, and it may

be operated by a semiskilled operator. The arc welds are satisfactory. However, spot checks are still advisable. The preparations for the installation of a welding robot must be precise and strict. Auxiliary equipment needed is costly; thus, cost forecasts are essential before welding robots are installed. Wherever they can be properly used, welding robots contribute significantly to productivity and efficiency. Figures 10; table 1; references 11 (Western).

CSO: 1861

NONLINEAR STABILITY ANALYSIS OF PSEUDO-CYLINDRICAL SHELLS

Budapest ACTA TECHNICA in English and German Vol 86 No 1-2, 1979 pp 9-41
manuscript received 30 Mar 77

KNAPP, R. H., Ph.D., Assistant Professor of Mechanical Engineering and
SZILARD, R., Dr. Ing., Professor of Civil Engineering, Adjunct Professor of
Ocean Engineering, University of Honolulu, Hawaii, U.S.A.

[Article published in English]

[Abstract] An unconventional geometric configuration is introduced for cylindrical shells. The cylindrical surface has been replaced by an assemblage of flat polyhedral elements. The buckling characteristics of the thus obtained pseudo-cylindrical concave polyhedral shell, subjected to external pressure, is analyzed, using the finite element approach and verifying the computer results by carrying out a small-scale model test. Results of these two methods agreed well with each other. Comparison with the buckling pressure of a "true" cylindrical shell indicated that the proposed modification of the geometric configuration yielded a much higher buckling resistance. The pseudo-cylindrical shell exhibited other desirable structural properties, such as relative ease in fabrication and high insensitivity to initial imperfections, and therefore it is recommended for use in undersea structures. Figures 22; references 50 (Western).

THE INITIAL ECCENTRICITY TO BE TAKEN INTO ACCOUNT IN INVESTIGATING THE LOCAL BUCKLING OF SHELL STRUCTURES

Budapest ACTA TECHNICA in German and English Vol 86 No 1-2, 1979 pp 157-167
manuscript received 20 Apr 77

DULACSKA, A., candidate of technical sciences

[Article published in German]

[Abstract] When calculating the buckling of shells made of elastic materials, the initial eccentricity of the stresses developed in the wall plays an important role. The goal of the study was to establish to what extent the initial eccentricity does reduce the critical load which causes buckling in the shell, in order to determine the magnitude that must be taken into account in the calculations. For this reason, the eccentricity caused by the initial unintentional waviness and edge disturbances, was closely examined. Figures 6; references 31: 27 Western, 1 Russian, 3 Hungarian.

INVESTIGATIONS ON THE LIMIT LOAD OF SLEEVE BEARINGS LINED WITH THIN POLY-AMIDE AND THEIR POSSIBLE APPLICATIONS

Budapest GEP in Hungarian Vol 30 No 10, Oct 78 pp 381-385

SERES, LASZLO, Dr, university lecturer, Faculty of Transportation Engineering, Department of Machine Components, BME [Budapest Technical University]

[Abstract] Studies on sleeve bearings lined with 0.3 mm Polyamide 11 + 1.5% MoS₂ are described. With a given oil lubrication, the polyamide layer significantly increases loadability and extends the rotating-speed range compared to bearings with a thick polyamide lining. The bearing play may be reduced if a thin polyamide lining is used; this is an advantage for bearings operated under hydrodynamic lubrication. Sleeve bearings with a thick polyamide lining require larger play, which contributes to the development of eccentricity and subsequent overheating and wear. The sleeve bearings lined with thin polyamide have outstanding wear and loadability characteristics; as a matter of fact, loadability increases significantly, especially in the range of circumferential speeds of less than 2 m/s. In the circumferential speed range of 2-8 m/s, the loadability is comparable to that of bearings lined with bearing metal. Temperatures as high as 80-100°C, however--which would develop at higher speeds--may affect bearing performance adversely. Polyamide-lined bearings may be used in most areas of manufacturing. However, their use provides advantages only in selected fields, which must be investigated by means of trials. Figures 11; references 10: 2 Western, 2 Russian, 6 Hungarian.

CSO: 1861

ACHIEVEMENTS IN PHOTOGRAMMETRY, AERIAL PHOTOGRAPHY

Bucharest FLACARA in Romanian 12 Jul 79 p 10

[Interviews with IGECOT personnel, by Razvan Barbulescu]

[Text] IGECOT, as everyone knows, is the Institute for Geodesy, Photogrammetry, Cartography, and Territorial Organization.

[Question] If I understand correctly, you are Nicolae Zegheru, director of IGECOT and a geodesic engineer. Why did you specialize in photogrammetry? Why did you choose photogrammetry and not geodesy?

[Answer] It is probably a matter of temperament. Geodesy is applied mathematics, a more arid, drier subject. It does not suit me. Photogrammetry is much more complex, more exciting. Twenty-five years ago it was at its beginnings, at the same point at which teledetection finds itself today.

[Question] Since when has teledetection been considered in our country?

[Answer] Since 1970, and its introduction is associated with the name of professor Nicolae Oprescu, department head at the Institute for Constructions of Bucharest.

[Question] What can you read in an aerial photograph, that is one obtained from a plane, or in a space photograph, obtained from a satellite?

[Answer] A great deal of information about the earth. About its surface, about its subsoil. A wealth of facts about, to give one example, the state of health of the planet and of its beings. Sometimes the earth must be seen from above to be better understood. I find that perspective helps.

[Question] We'll probably come back to this topic. But tell me, what does the image of the earth suggest to you when you fly in a plane? What do you think about? I have in mind a certain professional deformation. I believe for instance that an agronomist envisages entirely different matters: what crops exist in a given zone, what could be done in another one.

[Answer] All kinds of solutions come to my mind: I would reduce the area of a village here, because I can clearly see how it encroaches on agricultural land by spreading in a topsy-turvy manner, and I would change the path of roads there, because they make long detours. I think that an agronomist would consider other matters.

[Question] How could this be achieved without the existence of photogrammetry, or more recently, of teledetection?

[Answer] Our information would be poorer. The images received from satellites are beginning to provide an actual image of the earth.

[Question] As far as I know, several theories exist in this respect. The earth is not quite as we have learned it to be.

[Answer] Some sustain that it resembles a pear, others that it resembles a potato, and so on. But even potatoes come in different shapes, and it is difficult to say that one or the other are right without complete proof. Be that as it may, a specialist could elucidate that for you better than me.

[Question] From what altitude does the satellite record? Specifically, what altitude has it reached?

[Answer] The stationary satellite records at 36,500 km. At this point the satellite displacement occurs at the same time as the earth rotation, giving the impression that it is stationary. But the more common satellites are those who move at altitudes between 200 and 300 km, and up to 1000 km.

[Question] Photogrammetry and teledetection have many applications. Could you come back to this topic and explain what is shown by an aerial or space photograph?

[Answer] With one clarification: teledetection begins where photogrammetry leaves off. What I have to say is not new, we all know it: the earth is like a being. It is a living body. It has a temperature, humidity, color, and various manifestations with time. Even pulsations. It lives. It is sick in some portions, healthy in others. Using teledetection, you can feel it, and that is impressive, but you can feel it and help it. Teledetection offers the data of a diagnosis. Either by emitting and receiving spectral responses, or by recording information regarding temperature, color, and so on. But things become even more complex.

[Question] You are right. To what level has teledetection been developed in the world?

[Answer] That's very simple. It is highly developed in countries with advanced space technologies. But all countries are interested in receiving and processing teledetection data concerning their own territories. And our country collaborates very actively with those developed nations. In fact,

it should be pointed out that in photometry we are at the same advanced level reached by the countries which launch satellites. Moreover, we also export this knowledge. We prospect areas and plan projects, particularly in the agricultural domain. And I would like to add something here.

[Question] Please.

[Answer] The development of photometry and collaboration with other countries in teledetection, would not have been possible in our country without the development and modernization of other fields, such as computerization, electronics, geodesy, and photogrammetry.

Engineer Iancu Toader, head of the Geodesy Shop at IGFCOT is one of those old craftsmen who has the wise belief that for anything to be done well, it must be done at its proper time. With skill and interest, with hard work and intelligence, because it is not right to move from the school desk to the pleasures of a laboratory without knowing the meaning of field work. It is not merely a matter of ethics, that would be too simple, but rather one of training a man into a complete specialist, who started from A, and continued along the line to the end of the alphabet. "In the field you form your eye, because field work is part of the basics of the profession. Today's field work is not the same as the one of 25 years ago. In those days you wore out two pairs of boots in one field trip, from the middle of April to the middle of November, and no matter how fast you went you could not map more than 3000 hectares of land. Today, thanks to photogrammetry, one person can map more than 18,000 hectares during the same amount of time". Of course, these figures are also a measure of the specialist's technique. There are those who say that topographers today must also know aerial navigation. What are the facts? "It's simple: each person takes care of his own but collaborates perfectly. The topographers in the field create the mathematical framework to support the photographs taken from the air. A good understanding must exist between those of us on the ground and those who take the pictures from the air, so that together we bring the field into the laboratory where all the data and information is processed. This is where the maps come to life."

Is it in fact difficult to make a map? Of a city, for instance? We asked this question of Engineer Nicolae Cochina, who works in the photometry sector, a man deliberate in his speech, who weighs everything he says, and sometimes expresses doubts. "It is difficult to answer this question with a yes or a no. The difficulty of a map depends on very many things. I will give you one example. After the recent land slide at Malul cu Flori, following the rains of about one month ago, researchers from our institute immediately flew over the area, and within only 24 hours we produced a photo-diagram which very clearly showed how the slippage occurred, the dimensions of the displacement, as well as other data which was immediately used by geologists and land improvement specialists. This case involved a photo-diagram. To answer your question, I will tell you that the Sector 1 map of Bucharest was produced in one month, but we did use already existing information and calculations performed on other occasions. However, the

advantages of photogrammetry, of photos taken from planes, are significant in terms of shortening the time needed to execute a map. But it is possible to talk for days on end about the applications of pictures obtained from the air." If you had to provide an example of the applications of photogrammetry, where would you begin? "I have no special preference, but I do remember a unique experience. Several years ago, and for various reasons, the Vidraru dam lake was emptied. This gave us the possibility of drawing a topographic plan of the lake for silting studies. Silting studies are usually difficult to perform by traditional soundings of the lake bottom, and the results are rather approximate. Well, we flew in one day, took our pictures, and in two weeks we had a photogrammetric map. In only two weeks and with great accuracy. The data obtained from the plane was introduced into very precise instruments, complex instruments, and a job of several months was completed in those two weeks."

[Question] Engineer Alexandru Dinescu, we resume our discussions with you. What is the importance of a geodesic point?

[Answer] The geodesic system is the foundation of all our activities in all areas, and is used to draw any plot or topographic map.

[Question] Can you give us an example?

[Answer] A simple one is that of railroad or hydroelectric plant tunnels. It is obvious that when you start to build a tunnel from its two ends, the builders must meet very accurately, without deviation, and certainly not miss each other. In the absence of a network of geodesic points, a tunnel would be built by trial and error. Every detail of construction, every channel of communication is connected with this network of points.

[Question] How are geodesic points established?

[Answer] A fundamental point is selected, whose astronomic latitude and longitude is determined with respect to the position of the stars.

[Question] This seems to be our most direct and palpable connection with space. I am thinking about what I learned earlier, that these geodesic points are marked with concrete piles, well anchored in the earth and which carry specific markings on their surface.

[Answer] This is the poetic aspect of research. Geographic coordinates are next transformed into plane coordinates. In addition, the astronomic azimuth of a direction is very accurately determined to orient a network of points.

[Question] And our need for certainty is fulfilled.

[Answer] Not yet. In addition to its planimetric coordinates, each geodesic point also has a third coordinate: its height above sea level. Beyond the scientific problem of level (which refers to this third

dimension), which is concerned with the difference between the levels of two seas located a large distance from one another, and with the motion of the earth's crust, there also exist many practical applications.

[Question] For instance?

[Answer] Irrigation of extensive areas is not possible without an accurate knowledge of the height of neighboring points, because despite everything, water runs only downhill.

Air photography does not mean vacation pictures. The photographing of an area of the earth from a plane requires perseverance and experience, a trained eye, and a sure hand for navigation. The best TAROM pilot could not handle at first try, a light plane which must be skilfully flown to serve the needs of photogrammetric specialists. The pilot must understand the work of the researcher, and the latter must know something about flying an airplane. As engineer Marin Han, a researcher with many hours of flight, explained to me, "our flights are not pleasure trips. Very often, after flying eight hours in one day, you feel as if you had marched fifty kilometers. You have to find the best angle for the picture, and you must shoot at the right time. You lose the moment and you have to do it again. You guide the pilot, you make sure that no color is left unrecorded between photographed areas, you return, you miss it, you start all over again, and so on, until you have satisfactorily covered the zone which you need. That is how your work becomes useful."

The usefulness of photogrammetry is also reflected in many activities which we could call earthy, although the subsoil is also given its due. Agriculture derives the greatest profit from this work. The soil can be observed, and any one year's crop can be estimated. Degraded land can be detected, as well the means for placing fertile soils back into agricultural use. For instance, when the Danube-Black Sea Canal was begun, the fertile soil uncovered in that zone was transported to neighboring zones which were poor producers or degraded. Nothing is wasted. At Rovinari, after the surface mining of a layer of coal, the fertile earth was replaced and the land was returned to agriculture. Without this high-altitude view, without this perspective of the surface, their life would have been different. The virtues of photogrammetry disclose the breathing of the earth. A forest attacked by pests shows up as a sick being, with temperature differences well disclosed by unconventional, infrared recordings. We have gone beyond this field and we are entering teledetection. In black and white, the differences are those of shading. In some countries, it has even been possible to detect sick animals in large herds, using air photography. The applications are numerous and often aimed at the spectacular. Water reserves for the current year can be calculated with high-altitude photography by recording the snow cover, a situation which again benefits agriculture. This year's irrigation systems for Dobrogea were prepared on the basis of such calculations.

I have left for last an application which concerns in equal measure the spectacular aspects of photogrammetry, and as an example, the soil of Dobrogea. It refers to archeology. A picture taken from a high altitude offers a perspective which is forbidden at earth level. Old settlements, quietly and mysteriously hidden underneath a wheat field, betray their outlines and the film records their barely defined, thin traces. In these locations, along these lines, the color of the grass is different, the wheat changes its tone, the field itself stands out. Traces covered for centuries appear clearly in the picture, and mysterious signs of life are integrated into a whole to become meaningful. History is revealed. Troubling images of castles emerge from an earth which lets you guess nearly nothing. Not long ago, this was the case of the medieval city Ester, certified for the first time in 1538, during the expedition of the sultan Suleiman the Magnificent against Petru Rares. The traces of the former city are found at Valea Gura Dobrogei, nearly two kilometers from the point at which the valley meets the Casimcea River. The photograph which identified the old city very clearly shows the traces of the former streets and buildings of Ester. The discoverers were the engineers Mihai Rada and Nicolae Cochina.

The thrill is for the archeologist, but primarily for the one who at an altitude of nearly a thousand meters, passionately and with infinite patience seeks the best angle, waits for the right moment, misses, returns, and exposes the film to help us better and more deeply understand our earth.

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